1. A controlled, switched laser system for vaporizing a target structure on a substrate, comprising:

a diode-pumped, solid-state laser assembly; and

a controllable switch for controlling the on/off state and power level of the laser assembly;

the laser assembly having a laser beam output with an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher, and a wavelength beyond the absorption edge of the substrate in order to obtain low absorption of the laser beam output by the substrate;

whereby heating of the substrate and hence damage to the substrate is limited due to the output pulse width being less than about 8 nanoseconds and due to the wavelength being beyond the absorption edge of the substrate.

2. The laser system of claim 1 wherein the output pulse width of the laser beam output is less than about 5 nanoseconds at an operating repetition rate of about 5 kilohertz or higher.

3. The laser system of claim 2 wherein the output pulse width of the laser beam output is less than about 4 nanoseconds at an operating repetition rate of about 5 kilohertz or higher.

4. The laser system of claim 3 wherein the output pulse width of the laser beam output is less than about 4 nanoseconds at an operating repetition rate of about 8 kilohertz or higher.

5. The laser system of claim 2 wherein the output pulse width of the laser beam output is less than about 5

nanoseconds at an operating repetition rate of about 10 kilohertz or higher.

6. The laser system of claim 1 wherein the output pulse has a peak beam power sufficiently high to evaporate a metal link in a high-density memory.

7. The laser system of claim 1 wherein the laser assembly comprises a neodymium vanadate laser.

8. The laser system of claim 1 wherein the laser assembly comprises a neodymium:YLF laser.

9. The laser system of claim 1 wherein the laser assembly comprises a neodymium:YAG laser.

10. The laser system of claim 1 wherein the laser assembly comprises a laser having a cavity length optimized for limiting the output pulse width.

11. A method of vaporizing a target structure on a substrate, comprising the steps of:

providing a controlled, switched laser system comprising a diode-pumped, solid-state laser assembly and a controllable switch for controlling the on/off state and power level of the laser assembly;

producing a laser beam output having an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher, and a wavelength beyond the absorption edge of the substrate in order to obtain low absorption of the laser beam output by the substrate; and

directing the laser beam output at the target structure on the substrate to vaporize the target structure;

whereby heating of the substrate and hence damage to the substrate is limited due to the output pulse width being less than about 8 nanoseconds and due to the wavelength being beyond the absorption edge of the substrate.

12. The method of claim 11 wherein the target structure comprises a metal link in a high-density memory.

13. The method of claim 11 wherein the second target structure comprises a link formed of a material selected from the group of polysilicide, polysilicon, and like materials.

14. The method of claim 11 wherein the substrate comprises silicon.

15. A controlled, switched laser system for vaporizing a target structure on a substrate, comprising:

a diode-pumped, solid-state laser for producing a laser output with an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher;

a controllable switch for controlling the on/off state and power level of the laser; and

a wavelength shifter for shifting the wavelength of the laser output from a conventional wavelength to a wavelength beyond the absorption edge of the substrate in order to obtain a decrease in absorption of the laser output by the substrate due to the shift in the wavelength of the laser output.

16. The laser system of claim 15 wherein the laser is a tunable fosterite laser and the wavelength shifter is a tuner incorporated into the fosterite ~~laser~~.

17. The laser system of claim 15 wherein the wavelength shifter is not part of the laser.

18. The laser system of claim 17 wherein the wavelength shifter is removably insertable into the switched laser system so as to enable the switched laser system to operate at the conventional wavelength and at the wavelength beyond the absorption edge of the substrate.

19. The laser system of claim 15 wherein the conventional wavelength is about 1.047 μm.

20. The laser system of claim 15 wherein the conventional wavelength is about 1.064 μm.

21. The laser system of claim 20 wherein the output pulse width of the laser output is less than about 4 nanoseconds at an operating repetition rate of about 8 kilohertz or higher.

22. The laser system of claim 20 wherein the output pulse width of the laser output is less than about 5 nanoseconds at an operating repetition rate of about 10 kilohertz or higher.

23. The laser system of claim 15 wherein the wavelength shifter is a Raman shifter.

24. The laser system of claim 15 wherein the output pulse has a peak beam power sufficiently high to evaporate a metal link in a high-density memory.

25. A method of vaporizing a target structure on a substrate, comprising the steps of:

providing a controlled, switched laser system comprising a diode-pumped, solid-state laser and a controllable switch for controlling the on/off state and power level of the laser;

producing a laser output having an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher;

shifting the wavelength of the laser output from a conventional wavelength to a wavelength beyond the absorption edge of the substrate in order to obtain a decrease in absorption of the laser output by the substrate due to the shift in the wavelength of the laser output; and

directing the laser output at the target structure on the substrate to vaporize the target structure.

26. A controlled, switched laser system for vaporizing a target structure on a substrate, comprising:

a diode-pumped, solid-state laser assembly; and

a controllable switch for controlling the on/off state and power level of the laser assembly;

the laser assembly having a laser beam output having an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher, and a wavelength beyond the absorption edge of the substrate but shorter than 1.2 μm in order to obtain low absorption of the laser beam output by the substrate;

whereby heating of the substrate and hence damage to the substrate is limited due to the output pulse width being less than about 8 nanoseconds and due ~~to~~ the wavelength being beyond the absorption edge of the substrate, and whereby good depth of focus of the laser beam output is maintained relative to spot size of the laser beam output due to the wavelength being less than about 1.2 μm.

27. The laser system of claim 26 wherein the output pulse has a peak beam power sufficiently high to evaporate a metal link in a high-density memory.

28. A method of vaporizing a target structure on a substrate, comprising the steps of:

providing a controlled, switched laser system comprising a diode-pumped, solid-state laser assembly and a controllable switch for controlling the on/off state and power level of the laser assembly;

producing a laser beam output having an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher, and a wavelength beyond the absorption edge of the substrate but shorter than 1.2 μm in order to obtain low absorption of the laser beam output by the substrate; and

directing the laser beam output at the target structure on the substrate to vaporize the target structure;

whereby heating of the substrate and hence damage to the substrate is limited due to the output pulse width being less than about 8 nanoseconds and due to the wavelength being beyond the absorption edge of the substrate, and whereby good depth of focus of the laser beam output is maintained relative to spot size of the laser beam output due to the wavelength being less than about 1.2 μm.

29. The method of claim 28 wherein the laser beam output has a spot size and depth of field sufficient for reliable processing of target structures on a substrate having a substantially non-flat surface.

30. The method of claim 29 wherein the laser beam output has a spot size and depth of field sufficient for reliable processing of target structures on a wafer having approximately an 8-inch diameter, a thickness of less than about 300 μm, and a substantial variation in flatness over its surface.

31. The method of claim 28 wherein the target structure vaporized by the laser beam output is about 1 μm wide.

32. The method of claim 28 wherein the target structure vaporized by the laser beam output is about 1/3 μm thick.

33. The method of claim 28 wherein the target structure comprises a metal link in a high-density memory.

34. A controlled, switched laser system for vaporizing a target structure on a substrate, comprising:

a diode-pumped, solid-state laser for producing a laser output with an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher;

a controllable switch for controlling the on/off state and power level of the laser; and

a wavelength shifter for shifting the wavelength of the laser output from a conventional wavelength to a

wavelength beyond the absorption edge of the substrate in order to obtain a decrease in absorption of the laser output by the substrate due to the shift in ~~the~~ wavelength of the laser output, the wavelength shifter enabling the switched laser system to operate at the conventional wavelength and at the wavelength beyond the absorption edge of the substrate;

the laser comprising optics for focusing a laser spot at the conventional wavelength and also, without modification of the optics, at the wavelength beyond the absorption edge of the substrate.

35. The laser system of claim 34 wherein the conventional wavelength is about 1.064 μm.

36. The laser system of claim 34 wherein the wavelength beyond the absorption edge of the substrate is shorter than 1.2 μm.

37. The laser system of claim 34 wherein the laser comprises optics optimized for operation at the conventional wavelength.

38. The laser system of claim 34 wherein the laser comprises optics optimized for operation at the wavelength beyond the absorption edge of the substrate.

39. The laser system of claim 34 the laser comprises optics optimized for operation at a wavelength intermediate between the conventional wavelength and the wavelength beyond the absorption edge of the substrate.

40. The laser system of claim 34 wherein the wavelength shifter is a Raman shifter.

41. The laser system of claim 34 wherein the output pulse has a peak beam power sufficiently high to evaporate a metal link in a high-density memory.

42. A method of vaporizing target structures on substrates, comprising the steps of:

providing a controlled, switched laser system comprising a diode-pumped, solid-state laser and a controllable switch for controlling the on/off state and power level of the laser;

producing a laser output having an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher;

directing the laser output at a first target structure on a first substrate to vaporize the first target structure, the laser output being at a wavelength beyond the absorption edge of the first substrate in order to obtain low absorption of the laser output by the first substrate, the laser output being focused by optics of the laser;

shifting the wavelength of the laser output from the wavelength beyond the absorption edge of the first substrate to a conventional wavelength; and

directing the laser output at a second target structure on a second substrate to vaporize the second target structure, the laser output being at the conventional wavelength, the laser output being focused by the optics previously used to focus the laser output onto the first substrate, without modification of the optics.

43. The method of claim 42 wherein the second target structure comprises a link formed of a material selected from the group of polysilicide, ~~,~~ polysilicon, and like materials.

44. The method of claim 42 wherein the first target structure comprises a metal link.

45. A controlled, switched laser system for vaporizing a target structure on a substrate, comprising:

a diode-pumped, solid-state laser for producing a laser output;

a controllable switch for controlling the on/off state and power level of the laser; and

a wavelength shifter for shifting the wavelength of the laser output from a first, conventional wavelength to a second wavelength beyond the absorption edge of the substrate but shorter than 1.2 μm in order to obtain a decrease in absorption of the laser output by the substrate due to the shift in the wavelength of the laser output, the wavelength shifter being removably insertable into the switched laser system so as to enable the switched laser system to operate at the conventional wavelength and at the wavelength beyond the absorption edge of the substrate;

whereby heating of the substrate and hence damage to the substrate is limited due to the second wavelength being beyond the absorption edge of the substrate, and whereby good depth of focus of the laser beam output is maintained relative to spot size of the laser beam output due to the second wavelength being less than about 1.2 μm.

46. The laser system of claim 45 wherein the laser output has an output pulse width less than about 8

nanoseconds at an operating repetition rate of about 5 kilohertz or higher, whereby heating of the substrate and hence damage to the substrate is limited due to the output pulse width being less than about 8 nanoseconds.

47. The laser system of claim 45 wherein the laser is a neodymium vanadate laser.

48 The laser system of claim 45 wherein the laser is a neodymium:YLF laser.

49 The laser system of claim 45 wherein the laser is a neodymium:YAG laser.

50. The laser system of claim 45 wherein the laser has a cavity length optimized for limiting the output pulse width.

51. The laser system of claim 45 wherein the laser comprises optics optimized for operation at the conventional wavelength.

52. The laser system of claim 45 wherein the laser comprises optics optimized for operation at the wavelength beyond the absorption edge of the substrate.

53. The laser system of claim 45 the laser comprises optics optimized for operation at a wavelength intermediate between the conventional wavelength and the wavelength beyond the absorption edge of the substrate.

54. The laser system of claim 45 wherein the wavelength shifter is a Raman shifter.

55. The laser system of claim 45 wherein the output pulse has a peak beam power sufficiently high to evaporate a metal link in a high-density memory.

56. A method of vaporizing target structures on substrates, comprising the steps of:

providing a controlled, switched laser system comprising a diode-pumped, solid-state laser and a controllable switch for controlling the on/off state and power level of the laser;

producing a laser output having an output pulse width less than about 8 nanoseconds at an operating repetition rate of about 5 kilohertz or higher;

directing the laser output through a removably insertable wavelength shifter to a first target structure on a first substrate to vaporize the first target structure, the laser output being at a wavelength beyond the absorption edge of the first substrate but shorter than 1.2 μm in order to obtain low absorption of the laser output by the first substrate while maintaining good depth of focus of the laser beam output relative to spot size of the laser beam output;

removing the removably insertable wavelength shifter from the switched laser system, in order to shift the wavelength of the laser output from the wavelength beyond the absorption edge of the first substrate to a conventional wavelength; and

directing the laser output at a second target structure on a second substrate to vaporize the second target structure, the laser output being at the conventional wavelength.